of air. This assumption is close enough for the purpose and saves much laborious calculation. In addition it compensates to some extent for the fact that the air naturally contains a certain amount of water vapor and that all combustible gases carry water vapor, being generally saturated at ordinary temperatures.

Table 6 gives the usual combustible elements of fuels, their molecular weights and the amount of heat released in calories per gram molecule at constant pressure, water assumed to remain a vapor. While this last assumption gives lower thermal values it agrees with practice, inasmuch as water vapor never condenses within the furnace. The reaction formulas given in this table do not contain the nitrogen. Table 7 is merely an extension of this table, giving oxygen required for the hydrogen and carbon and the total oxygen, the volume of nitrogen and the air volume, as well as the volume of the products of combustion. This table is based on the assumption that the air consists of 1 volume of oxygen and 4 of nitrogen.

The first step in the plotting of. these curves is the computation on Table 1, in which the volumetric composition of the gas is considered as giving the number of gram molecules. These are multiplied by the calories released per molecule at constant pressure, and the summation of these values gives the total heat released by the combustion of 100-g molecules of the gas. In the case of solid or liquid fuels it is necessary to divide the weight of each element multiplied by 10 by the molecular weight of the substance or use weight values for the heat released. The products of combustion and the amount of oxygen required are tabulated for the combustible portions of the fuel, and summed with the inert portions of the fuel. When the fuel contains oxygen the amount of this oxygen is deducted from the

total of the oxygen column and four times this value is deducted from the total of the nitrogen column. The summation of these four columns gives the total amount of oxygen required and the products of complete combustion in air. If the weight of the fuel is desired the number of molecules may be multiplied by the molecular weights. This total weight may be readily converted to the specific weight of a unit volume.

Should it be desired to note the effect of reducing the air supply, deficiencies of 20 and 40 per cent are generally assumed in order to get three points. Hydrocarbons are assumed to dis-